

***EFFICACY OF AEROSOL – CLOUD INTERACTIONS UNDER VARYING  
METEOROLOGICAL CONDITIONS: SOUTHERN GREAT PLAINS VS. PT. REYES***

B.-G. Kim, M. Miller, S. Schwartz, Y. Liu, M. Dunn, and Q. Min

*Presented at the*  
Eighteenth Annual Atmospheric Radiation Measurement (ARM)  
Science Team Meeting,  
Norfolk, VA  
March 10-14, 2008

**Environmental Sciences Department/Atmospheric Sciences Division**  
**Brookhaven National Laboratory**  
P.O. Box, Upton, NY  
[www.bnl.gov](http://www.bnl.gov)

**ABSTRACT**

Several studies have demonstrated that cloud dynamical processes such as entrainment mixing may be the primary modulator of cloud optical properties in certain situations. For example, entrainment of dry air alters the cloud drop size distribution by enhancing drop evaporation. However, the effect of entrainment mixing and other forms of turbulence is still quite uncertain. Although these factors and aerosol-cloud interactions should be considered together when evaluating the efficacy of aerosol indirect effects, the underlying mechanisms appear to be dependent upon each other. In addition, accounting for them is impossible with the current understanding of aerosol indirect effect. Therefore, careful objective screening and analysis of observations are needed to determine the extent to which mixing related properties affect cloud optical properties, apart from the aerosol first indirect effect.

This study addresses the role of aerosol-cloud interactions in the context of varying meteorological conditions based on ARM data obtained at the Southern Great Plains (SGP) site in Oklahoma and at Pt. Reyes, California. Previous analyses of the continental stratiform clouds at the SGP site have shown that the thicker clouds of high liquid water path (LWP) tend to contain sub adiabatic LWPs. These sub adiabatic LWPs, which result from active mixing processes, correspond to a lower susceptibility of the clouds to aerosol-cloud interactions, and, hence, to reduced aerosol indirect effects. In contrast, the consistently steady and thin maritime stratus clouds observed at Pt. Reyes are much closer to adiabatic. These clouds provide an excellent benchmark for the study of the aerosol influence on modified marine clouds relative to continental clouds, since they form in a much more homogeneous meteorological environment than those at the continental site.

---

**NOTICE:** This manuscript has been authored by employees of Brookhaven Science Associates, LLC under Contract No. DE-AC02-98CH10886 with the U.S. Department of Energy. The publisher by accepting the manuscript for publication acknowledges that the United States Government retains a non-exclusive, paid-up, irrevocable, world-wide license to publish or reproduce the published form of this manuscript, or allow others to do so, for United States Government purposes.